

CLAIMS

1. Device for mode-locking a laser, in particular a laser of pulsed type, comprising a resonant cavity (20),

- 5 - delimited by a first mirror (1) and a second mirror (8), ✓
- provided with an active laser gain medium (5) for amplifying a laser radiation beam at the fundamental frequency (ω_1), and
- with a solid non-linear optical means (10) which
10 comprises at least said second mirror (8), for reversible conversion of the radiation at the fundamental frequency (ω_1) into radiation at a harmonic frequency (ω_2), said non-linear optical means having a reflection coefficient which increases as the intensity of the radiation at the
15 fundamental frequency increases,

said device further comprising, arranged in the resonant cavity (20), a solid intensity limiter (4) whose transmission coefficient of the laser radiation decreases as the intensity of said radiation increases, characterized
20 in that said intensity limiter (4) comprises a GaAs, CdSe or InP plate.

2. Device according to Claim 1, characterized in that the non-linear optical means (10) comprises said second mirror (8) which corresponds to a dichroic mirror
25 and a non-linear crystal (7) able to convert the radiation at the fundamental frequency into radiation at a harmonic frequency.

3. Device according to Claim 1, characterized in that the non-linear optical means (10) comprises said
30 second mirror (8) which corresponds to a dichroic mirror, a non-linear crystal (7) able to convert the radiation at the fundamental frequency into radiation at a harmonic frequency, and at least one component for polarization selection and/or modification.

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4. Device according to Claim 2[or 3], characterized in that said non-linear crystal is a

BBO crystal.

6. Device according to ~~[one of the preceding]~~ C[c]laim[s] 1, characterized in that the intensity limiter (4) and the non-linear optical means (10) are placed on either side of the active gain medium (5).

7. Device according to ~~[one of the preceding]~~ C[c]laim[s] 1, characterized in that the intensity limiter (4) is placed between the non-linear optical means (10) and the active gain medium (5).

8. Device according to ~~[one of the preceding]~~ C[c]laim[s] 1, characterized in that the active gain medium is an Nd:YAG crystal.

9. Device according to ~~[one of the preceding]~~ C[c]laim[s] 1, characterized in that the non-linear optical means (10) has a reflection coefficient of the radiation at the second harmonic (ω_2) which is greater than the reflection coefficient of the radiation at the fundamental frequency (ω_1).

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4. Device according to Claim 2 or 3, characterized in that said non-linear crystal is a BBO crystal.

5. Device according to Claim 1, characterized in that the non-linear optical means (10) comprises only the second mirror (8), said second mirror corresponding to a Fabry-Perot anti-resonant saturable absorber constructed from a superposition of dielectric or metallic semiconductor films.

6. Device according to one of the preceding claims, characterized in that the intensity limiter (4) and the non-linear optical means (10) are placed on either side of the active gain medium (5).

7. Device according to one of the preceding claims, characterized in that the intensity limiter (4) is placed between the non-linear optical means (10) and the active gain medium (5).

8. Device according to one of the preceding claims, characterized in that the active gain medium is an Nd:YAG crystal.

9. Device according to one of the preceding claims, characterized in that the non-linear optical means (10) has a reflection coefficient of the radiation at the second harmonic (ω_2) which is greater than the reflection coefficient of the radiation at the fundamental frequency (ω_1).

10. Device for mode-locking a laser, in particular a laser of pulsed type, comprising a resonant cavity (20),

- delimited by a first mirror (1) and a second mirror (8),
- provided with an active laser gain medium (5) for amplifying a laser radiation beam at the fundamental frequency (ω_1), and
- a solid non-linear optical means (10) which comprises at least said second mirror (8), for reversible conversion

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of the radiation at the fundamental frequency (ω_1) into radiation at a harmonic frequency (ω_2), said non-linear optical means (10) having a reflection coefficient which increases as the intensity of the radiation at the fundamental frequency increases,

characterized in that said device is provided with an intensity limiter comprising a GaAs, CdSe or InP plate with a transmission coefficient which decreases as the intensity of the radiation at the fundamental frequency increases, [so as to ensure, in combination with said non-linear optical means (10), both a positive feedback and a negative feedback on the quality factor of the resonant cavity (20).

11. Process for mode-locking a laser, in particular a laser of pulsed type, characterized in that it comprises:

- emitting a laser radiation beam at the fundamental frequency (ω_1) by stimulating an active laser medium (5),
- converting the beam at the fundamental frequency (ω_1) into a beam at a harmonic frequency (ω_2),
- returning the beam at the harmonic frequency (ω_2) to the resonant cavity (20),
- reconvertng the beam at the harmonic frequency (ω_2) into a beam at the fundamental frequency (ω_1), and
- limiting the intensity of the beam at the fundamental frequency (ω_1) inside the resonant cavity (20), by means of at least one GaAs, CdSe or InP plate.

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